

What is claimed is:

1. A gene delivery complex comprising
foreign genetic material and a non-viral vector,
wherein the vector has a first site having specific affinity for the
foreign genetic material and a second site having specific affinity for a
receptor on an antigen presenting cell.

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2. The gene delivery complex of Claim 1, wherein the foreign genetic
material is selected from the group consisting of RNA and DNA.

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3. The gene delivery complex of Claim 1, wherein the foreign genetic
material encodes a reverse-transcriptase dependent virus or a mutant
reverse-transcriptase dependent virus.

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4. The gene delivery complex of Claim 3, wherein the foreign genetic
material is DNA encoding at least a substantial portion of a replication-
defective human immunodeficiency virus.

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16. The gene delivery complex of Claim 3 or 4, wherein the foreign genetic
material is DNA encoding at least a substantial portion of an integration-
defective human immunodeficiency virus.

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6. The gene delivery complex of Claim 5, wherein the foreign genetic
material is DNA encoding at least a substantial portion of an integrase
negative mutant of a dual-tropic primary isolate of a human
immunodeficiency virus.

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8. The gene delivery complex of Claim 6, wherein the DNA further
includes one or more stop codons in one or more of the reading frames
of the integrase gene.

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The gene delivery complex of Claim 1, wherein the complex is
selected from the group consisting of DNA conjugates of sugars,
polyethylenimine, polyethylenimine derivatives, and mixtures thereof.

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10. The gene delivery complex of Claim 8, wherein the complex is a DNA
conjugate of sugar-modified polyethylenimine.

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12. The gene delivery complex of Claim 8, wherein the complex has a
specific affinity for the mannose receptor.

13. The gene delivery complex of Claim 1, wherein the antigen
presenting cell is a Langerhans cell.

14. The gene delivery complex of Claim 1, wherein the antigen
presenting cell is a dendritic cell.

14. The gene delivery complex of Claim 1, wherein the receptor is a mannose receptor.

15. Method of transducing cells with foreign genetic material comprising the steps of exposing the cells to the gene delivery complex described in any one of Claims 1 - 10.

5 16. Method of making a gene delivery complex comprising the steps of
(a) selecting a target cell having a receptor site,
(b) selecting a delivery complex as described in any one of Claims 1-
10,
(c) exposing the cell to the gene delivery complex under conditions
suitable for receptor-mediated endocytosis.

10 17. Method of preventive and therapeutic immunization for animals by
exposing the animal to a gene delivery complex described in any one
of Claims 1-10.

15 18. Method of preventive and therapeutic immunization for animals against
reverse-transcriptase-dependent virus infection, the steps comprising
isolating dendritic cells from the animal,
exposing the cells to the gene delivery complex described in Claim
17, and reintroducing the cells to the body of the animal.

20 19. Method of preventive and therapeutic immunization for animals against
reverse-transcriptase-dependent virus infection, the steps comprising
exposing the animal to the gene delivery complex described in Claim
17 on the skin or on mucosa surfaces.

25 20. Method of treating active virus infection, the steps comprising:
treating a patient in need thereof with a drug combination suitable for
suppressing viral load,
immunizing the patient with the gene delivery complex of any one of
Claims 1 to 10, and
continuing treatment with a drug combination suitable for suppressing
viral load until immune response develops,
and monitoring for rebound of the patient's viral load; and in the event
viral load rebounds, restarting treatment with the drug combination, or
another drug combination suitable for suppressing viral load and
immunizing the patient with the gene delivery complex of any one of
Claims 1 to 10.

30 35 21. The method of Claim 20, wherein the active virus infection is an HIV
infection.

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22. Method of transcutaneous genetic immunization, the steps comprising complexing foreign genetic material with a non-viral vector selected from the group consisting of sugar, polyethylenimine, polyethylenimine derivatives, and mixtures thereof, and applying the complex to the skin or mucosa surfaces of an animal.

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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100